

Notes on the Life History of Opossums in West-Central Illinois

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ABSTRACT

Opossums (*Didelphis virginiana*) were captured and marked in west-central Illinois from fall 1989 through fall 1993. Females predominated in spring and fall for birth year and after birth year captures. The highest minimum density was 7.7 opossums per 100 ha in spring 1993. Eighty-eight percent (N = 42) of after-birth year females were carrying pouched young when captured in the spring and averaged 9.9 ± 0.5 young. Annual survival of marked opossums was low on the study area, with only 5 of 182 (1 male, 4 females) recaptured 1 year after initial capture. Opossums were captured more often than expected in oak-hickory stands and old fields and less than expected in crop fields, assuming a opossum distribution similar to our trap distribution.

INTRODUCTION

The opossum is present throughout Illinois, and aspects of its life history have been reported from northwest (Verts 1963), east-central (Sanderson 1961, Holmes and Sanderson 1965), and southern (Stieglitz and Klimstra 1962) Illinois.

These notes on the life history attributes of the Virginia opossum in west-central Illinois were collected incidentally when investigating the ecology and life history of the raccoon (*Procyon lotor*) from fall 1989 through fall 1993. Our purpose was to provide some additional information concerning opossum life history in Illinois.

METHODS

We livetrapped opossums during fall (Aug-Oct) and spring (Apr-Jun) from fall 1989 to fall 1993. For fall 1989 and spring 1990, the study area included 3,222 ha of the Purpus and Wells Creek watersheds in Brown County, west-central Illinois. Subsequently, the study area comprised only the 2,310 ha within the Wells Creek watershed. These study areas averaged 59% agricultural fields, 23% oak-hickory woodland, 12% pasture, 4% shrub-old field, and 1% ponds; the remainder was in farmsteads (<1%) and Conservation Reserve lands.

Opossums were livetrapped using box traps baited with sardines (Sanderson 1961). Traps were not placed in a grid pattern but were placed in locations thought to maximize captures of raccoons. During each trapping period, trapping was begun at the north end of the watershed and progressively moved south along the watershed, with traps set in a given location for 2-5 days before being moved to a new site. This trapping pattern allowed us to trap throughout a large area but minimized recaptures of both species within trapping periods.

Captured opossums were sexed, aged as either birth year (BY) or after birth year (ABY), weighed to the nearest 0.1 kg, ear-tagged, examined for pouched young (if female), and released at the trap site.

Sex and age ratios were tested for differences using Chi-square analysis. Sex differences in body weights and movements between and within trapping periods were examined using 1-way ANOVA. Habitat preferences were determined with Chi-square analysis using total trap nights within each habitat as the proportion of each habitat available and the total captures within each type as the observed use of each habitat.

RESULTS AND DISCUSSION

Populations

Females predominated in our captures ($P < 0.05$) (Table 1). Spring captures of ABY opossums averaged 68% female. Fall captures averaged 62% and 58% female for ABY and BY captures, respectively (Table 1). Based on other studies, livetrapped samples are biased toward females (Holmes and Sanderson 1965, Petrides 1949) whereas ratios derived from hunting and trapping are biased toward males (Reynolds 1945, Hamilton 1958). Females apparently are more susceptible to livetraps than are males (Holmes and Sanderson 1965, Blumenthal and Kirkland 1976). We sexed only a few young while they were still in the pouch ($N = 26$) and found nearly a 50:50 ratio (12 F:14 M). Pouched young averaged 51% male in New York (Hamilton 1958) and a 50:50 sex ratio for pouched young in east-central Illinois (Sanderson 1961) and south-central Pennsylvania (Blumenthal and Kirkland 1976).

The highest relative density of opossums (including young in the pouch) occurred in spring 1993, when 179 were captured on 2310 ha (7.7/100 ha). Seidensticker et al. (1987) estimated an average density of 3.9 opossums per 100 ha on a wooded site in Virginia. Other estimates have been 14 per 100 ha in New York (Van druff 1971), 13 per 100 ha in Kansas (Fitch and Sandidge 1953), 2 per 100 ha in Iowa (Wiseman and Hendrickson 1953), and 6 per 100 ha in Texas (Lay 1942). Holmes and Sanderson (1965), using after-weaning recoveries of young marked in the pouch, estimated between 223 and 634 opossums per mi^2 in east-central Illinois. These estimates may be inflated because of extensive dispersal from the study area by females with pouched young (Gillette 1980), but Holmes and Sanderson (1965) livetrapped up to 29 opossums per 100 ha. Our estimates of opossum densities were probably conservative compared to previous studies because other studies used higher trap densities set specifically for opossums.

Body Weights

In the fall, the average weight (mean \pm S.E.) of ABY males (3.02 ± 0.11 kg, $N = 43$) was significantly greater ($F = 7.07$, df 1,78, $P < 0.01$) than that of ABY females (2.6 ± 0.09 kg, $N = 37$). Males captured in the spring averaged 3.02 ± 0.15 kg. Female weights in the spring were biased by the presence of pouched young and were not indicative of female body mass. Male opossums are larger on average than females throughout their range (Hamilton 1958, Blumenthal and Kirkland 1976).

Reproduction

Spring breeding rates for ABY females averaged 88% ($N = 42$). Only 40% of the ABY females captured between late August and mid-October gave indication they had bred during the present year but fall examination is not a good indicator of the average breeding rate in opossums (Seidensticker et al. 1987). The breeding period extends from February through June in the Midwest (Petrides 1949, Reynolds 1945) with peaks in February and again in May because many females conceive 2 litters per year. Our trapping methodology did not provide data concerning the number of marked females conceiving multiple litters per year.

Pouched young were present with captured females from 10 April until 11 June. Twenty litters averaged 9.9 ± 0.5 young, with a range of 7 to 14, slightly larger than the 7.9 young per litter ($N = 85$ females) reported for east-central Illinois (Holmes and Sanderson 1965). Other average litter sizes reported include 8.9 in Missouri (Reynolds 1945), 8.6 in Nebraska (Reynolds 1952), 8.6 in New York (Hamilton 1958), and 8.2 in Oregon (Hopkins and Forbes 1979). Our recaptures were not frequent enough to estimate mortality rates for pouched young, reported to be $< 25\%$ for most females (Llewellyn and Dale 1964, Sanderson 1961).

Recovery Rates

Recapture rates of marked opossums were low in west-central Illinois for both the fall-to-spring and spring-to-fall intervals. For the fall-to-spring period, we recaptured none of 43 BY males, 2 of 30 BY females (6.7%), 1 of 61 ABY males (1.6%), and 8 of 48 ABY females (16.7%). For the spring-to-fall interval for ABY opossums only, we recaptured 5 of 25 males (20%) and 11 of 54 females (20%). Only 5 of 182 marked opossums (1 male, 4 females, 1.6%) were captured 1 year after initial capture. Seidensticker et al. (1987) found the number of females livetrapped after their birth year was more constant than the number of males livetrapped after their birth year, which was indicative of a lower dispersal rate for females.

In Virginia, maximum longevity was only 28 and 24 months for females and males, respectively, and only 8% of marked females survived into a second breeding season at age 24 months (Seidensticker et al. 1987). In east-central Illinois, Holmes and Sanderson (1965) found that only 5.0% of adult opossums were recaptured the year after initial tagging. Van Druff (1971) estimated an average winter carryover of 9.2% in New York. Gillette (1980) found that no adults present on a Wisconsin study area in 1971 survived to breed in 1972. Llewellyn and Dale (1964) captured only 6 of 224 opossums (2.6%) 1 year or more after initial tagging in Maryland. Fitch and Sandidge (1953) recaptured only 4 of 106 tagged opossums the year following marking in Kansas. Verts (1963) found the

maximum elapsed time between the first and last capture for any individual opossum was only 80 days in northwest Illinois.

Petrides (1949) calculated an average life expectancy from birth of 1.3 years for the opossum, with a 4.8-year turnover in the population. Llewellyn and Dale (1964) argued that Petrides' estimates were too high.

Movements

Our limited trapping program was not designed to assess home range size or to monitor daily activity. However, recaptures of previously marked individuals provided some indication of movements within and between trapping periods. For BY opossums within a fall trapping period, male movements averaged 186 ± 32 m ($N = 33$) and female movements averaged 201 ± 40 m ($N = 21$) between recaptures ($P > 0.10$). After birth-year male movements averaged 264 ± 51 m in the fall ($N = 21$) and 404 ± 207 m in the spring ($N = 6$) ($P > 0.10$). After birth-year female movements averaged 345 ± 98 m ($N = 33$) in the fall and 269 ± 46 m in the spring ($N = 30$) ($P > 0.10$). Movements between trapping periods were larger than within-period movements for both sexes. Fall-to-spring movements for juvenile females averaged 815 ± 356 m ($N = 5$); too few juvenile males were recaptured to estimate movements. For ABY opossums, male movements averaged $1,076 \pm 247$ m ($N = 7$) and female movements averaged 510 ± 251 m ($N = 20$) between recaptures in consecutive trapping periods ($P > 0.05$). The longest known movement of a marked opossum was 5.2 km for an ABY female.

Opossums have been described as nomads with no fixed abode (Reynolds 1945). However, Gillette (1980) using radio marked individuals, found that home range boundaries were quite flexible, but that ABY opossums of both sexes remained within definable home ranges for months at a time. He also found that BY young gradually moved away from their mother after weaning and that dispersal movements stopped with the advent of cold weather (Gillette 1980).

Several studies have demonstrated that dispersal is extensive among both BY and ABY opossums during the growing season (Gillette 1980, Fitch and Shirer 1970). Apparently, females disperse with pouched young. Such movements facilitate repopulation of depleted habitats and may be a contributing factor in the recent northward extension of their continental range (Gillette 1980).

Holmes and Sanderson (1965) found the average movement between recaptures in successive nights to be 228 m for BY opossums, 88 m for ABY females, and 162 m for ABY males. Other studies found the mean distance between captures to be 527 m (Verts 1963), 403 m (Wiseman and Hendrickson 1950), 445 m (Lay 1942), and 249 m (Fitch and Sandidge 1953). However, unrestricted nocturnal movements may be considerably greater because Seidensticker et al. (1987) found that radio marked opossums moved an average of $>1,100$ m per night throughout the year in Virginia. Gillette (1980) also followed radio marked opossums in Wisconsin and found nightly foraging movements during nonwinter months to average 946 m for males and 413 m for females. After-birth-year home ranges averaged 108 ha for males and 451 ha for females (Gillette 1980). Ryser (1992) found that home ranges of male opossums in Florida overlapped 5-7 females and

that males regularly moved over a well-defined area checking on the reproductive status of these females.

Habitat

Because traps were set to maximize captures of raccoons, our opossum captures may not be a true reflection of habitat selection by Illinois opossums. In all overstory types, traps were generally set along waterways to capture raccoons so captures reflect relative use of waterways within each habitat type. We used trap nights (1 trap set for 1 night) per habitat type as a measure of habitat availability. We found growing season captures to be more common than expected in oak-hickory and old field habitats and less frequent than expected in croplands (Table 2). Reynolds (1945) found that opossums in Missouri favored mixed age class forest along small streams, similar to the habitat favored in west-central Illinois and considered water to be an essential component of opossum home ranges. Llewellyn and Dale (1964) reported that opossums in Maryland were found primarily in low, dense woodlands near water but avoided crop fields and dry upland woods.

CONCLUSIONS

As noted by Seidensticker et al. (1987), the opossum is about as far toward the r side of the r/K strategies of the survival continuum as mammalian morphology and physiology make possible. Observations in west-central Illinois are consistent with an r-selected life history strategy, e.g., a short gestation, large litters with minimal parental care, rapid onset of puberty in both sexes, and high mortality rates. Low survival and high dispersal rates are normal for this species, with populations dominated by individuals < 2 years old (Seidensticker et al. 1987, Llewellyn and Dale 1964) In west-central Illinois, as elsewhere, opossum numbers fluctuate annually on the basis of resource availability (Seidensticker et al. 1987). At present, human exploitation is not an important mortality factor because of low pelt prices.

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Table 1. Sex and age of opossums captured in west-central Illinois 1989-93.

Season	Birth Year		After Birth Year		
	Male	Female	Male	Female	Total
Fall 1989	11	25	9	11	56
Spring 1990	–	–	5	11	16
Fall 1990	19	23	8	10	60
Spring 1991	–	–	4	8	12
Fall 1991	5	6	11	19	41
Spring 1992	–	–	3	18	21
Fall 1992	8	7	2	8	25
Spring 1993	–	–	13	17	30
Fall 1993	8	8	9	21	46
Total Spring	–	–	25	54	79
Fall	51	69	39	69	228

Table 2. Frequency of opossum captures during the growing season in west-central Illinois.

Habitat	Proportion Available ^a	Total Captures	Expected Captures	Chi-Square Values	P Values
Mature Oak Hickory	0.347	194	153	11.18	0.001
Crops	0.307	108	135	5.43	0.05
Pasture	0.103	34	45	2.83	NS ^b
Upland shrub	0.077	44	34	3.02	NS
Farmstead	0.054	19	24	0.9	NS
Ponds	0.034	11	15	1.1	NS
Successional Forest	0.027	7	12	2.0	NS
Old field	0.022	16	10	4.13	0.05
Grassland	0.011	1	5	3.05	NS
Fallow (CRP) ^c	0.009	4	4	0.002	NS

^a Proportion of trap nights in each habitat.

^b NS = Not significant.

^c CRP = Conservation reserve program.